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EVALUATION OF SURFACE ROUGHNESS OF DENTAL COMPOSITES SUBJECT TO DIFFERENT METHODS OF FINISHING AND POLISHING

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ABSTRACT

This research compares the effect of different rotary instruments for finishing (tungsten carbide laminated drill or diamond drill) on composite restorations and on the *interface* between enamel and composite. The composite resins used were HRi® (Micerium)-nanoparticle dental resin and Synergy®D6 (Coltène) nanohybrid resin. Surface roughness was evaluated using optical profilometry and studied with SensoScan software 5.3 (SensoTech, S.L.). Statistical analysis was performed using IBM SPSS software (v.23) to identify significant differences on the roughness surface on finishing and polishing procedures.

Keywords: composite resins, surface roughness, dental finishing, 3D profilometry.

INTRODUCTION

The aesthetics and durability of the dental restorations are related to finishing and polishing procedures, where special considerations must be made regarding the surface roughness. This depends of the grinding or cutting instruments, the composite resin properties and operator related factors. Uneven surfaces are more susceptible to plaque accumulation, gingival inflammation, periodontal disease, marginal infiltration of restoration and decay.

A total of 32 extracted human teeth were prepared with a cavity in a healthy surface. They were divided into equal groups and restored with the composite resins HRi® (Micerium) and Synergy®D6 (Coltène). Then, half of the groups restored by HRi® resin (Micerium) were subjected to laminate drill and the other half of the diamond drill. The same was applied to those restored with Synergy®D6 (Coltène). Surface roughness was evaluated using optical profilometry and studied with SensoScan software 5.3 (SensoTech, S.L.). Statistical analysis was performed using IBM SPSS software (v.23).

RESULTS AND CONCLUSIONS

The quantitative results of the roughness after the finishing and polishing of the samples can be seen in Table 1. There were no statistical differences between nanohybrid Synergy® D6 (Coltene) resin and nanoparticle HRi® (Micerium) resin. For finishing procedures, the laminated drill produces the lower surface roughness in all studied parameters.

Tungsten carbide (laminated) drill gave a better smoothness and better surface finishing procedure. The diamond (extra fine grit) drill shows better behavior when wearing two

different substrates simultaneously. The laminated tungsten drill does not work very well in two different substrates and it can cause defects in the marginal integrity. The laminate bit causes non-homogeneous behavior when it is wearing two different substrates. It should be used in such a way that it first reaches the enamel so as to create less friction and avoid deformation of the substrate, since it becomes more effective in removing material and generating heat.

Table 1 - Quantitative statistical analysis.

Média			Mean	Standard deviation	Parametric normality	Statistical significance
Finishing	Rugositiy	HRi Synergy	μ=0,596 μ=0,572	δ=0,18 δ=0,21	p=0,332 p=0,752	p=0,737
	FFT High pass 1% filter	HRi Synergy	μ=0,121 μ=0,195	δ=0,07 δ=0,08	p=0,002 p=0,049	p=0,003
Finishing	Rugositiy	Laminated bur Diamond drill	μ=0,459 μ=0,710	δ=0,14 δ=0,15	p=0,774 p=0,561	p=0,000
	FFT High pass 1% filter	Laminated bur Diamond drill	μ=0,116 μ=0,199	δ=0,06 δ=0,08	p=0,010 p=0,088	p=0,001
Finishing	Rugositiy	HRi/ Laminated bur HRi/ Diamond drill Synergy/ Laminated bur Synergy/ Diamond drill	μ=0,470 μ=0,721 μ=0,447 μ=0,698	δ=0,09 δ=0,16 δ=0,17 δ=0,16	p=0,888 p=0,617 p=0,450 p=0,987	p=0,001
	FFT High pass 1% filter	HRi/ Laminated bur HRi/ Diamond drill Synergy/ Laminated bur Synergy/ Diamond drill	μ=0,077 μ=0,164 μ=0,155 μ=0,234	δ=0,01 δ=0,07 δ=0,06 δ=0,09	p=0,859 p=0,040 p=0,303 p=0,126	p=0,000

3D profilometry is effective in surface study, although there are many factors that contribute to a variation of surface roughness: sensitivity of the technique, grain size of the drill bits, the pressure exerted by the operator, the cooling during cutting, the generated heat, among others. More studies are needed to understand an implication of roughness and the creation of marginal defects, with bacterial progression, pigment adhesion and, consequently, caries recurrence.

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